


Form PTO-1390		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER P19547
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/554617
INTERNATIONAL APPLICATION NO. PCT/JP99/05447	INTERNATIONAL FILING DATE 4 October 1999	PRIORITY DATE CLAIMED 5 October 1998	
TITLE OF INVENTION PRODUCTION METHOD OF DETERGENT AND PRODUCING APPARATUS			
APPLICANT(S) FOR DO/EO/US Kazuyoshi ARAI, Kazuhiro MIYAMAE, and Tomoki SEO			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.			
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> A Translation of the International Application into English (35 U.S.C. 371 (c)(2)). 7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)) 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). "Unexecuted" 10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (U.S.C. 371(c)(5)). Items 11. to 16. below concern other document(s) or information included: 11. <input type="checkbox"/> An information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input type="checkbox"/> A substitute specification. 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input type="checkbox"/> Other items or information: Cover Sheet and International Application as published in Japanese. PCT/RO/101-PCT Request (in Japanese). PCT/IB/304. PCT/IB/308. PCT/ISA/210-International Search Report (in English and Japanese). Claim of Priority. Cover Letter Under 35 U.S.C. 371 And 37 C.F.R. 1.495			
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17. <input checked="" type="checkbox"/> The following fees are submitted:				CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search report has been prepared by the EPO or JPO. \$ 840.00 International preliminary examination fee paid to USPTO (37 CFR 1.482). \$ 670.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO(37 CFR 1.445(a)(2)) \$ 760.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO. \$ 970.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4). \$ 96.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				\$840.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <u> 20 </u> <u> 30 </u> months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
Claims	Number Filed	Number Extra	RATE		
Total Claims	28 - 20 =	8	X \$18.00	\$144.00	
Independent Claims	5 - 3 =	2	X \$78.00	\$156.00	
Multiple dependent claim(s) (if applicable)			+ \$260.00	\$0.00	
TOTAL OF ABOVE CALCULATIONS =				\$1140.00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28)				\$	
SUBTOTAL =				\$1140.00	
Processing fee of \$130.00 for furnishing the English translation later than <u> 20 </u> <u> 30 </u> months from the earliest claimed priority date (37 CFR 1.492(f)).				+	\$
Extension of Time fee in the amount of \$				+	\$
TOTAL NATIONAL FEE =				\$1140.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+	\$
TOTAL FEES ENCLOSED =				\$1140.00	
				Amount to be refunded	\$
				Charged	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>1140.00</u> to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. <u> </u> in the amount of \$ <u> </u> to cover the above fees. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>19-0089</u> . NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status. SEND ALL CORRESPONDENCE TO: Bruce H. Bernstein GREENBLUM & BERNSTEIN, P.L.C. 1941 Roland Clarke Place Reston, VA 20191 (703) 716-1191					
				 SIGNATURE Bruce H. Bernstein NAME 29,027 REGISTRATION NUMBER	

P19547.A01

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Kazuyoshi ARAI et al.

Serial No : Not Yet Assigned (National Phase of PCT/JP99/05447)

Filed : Concurrently Herewith

For : PRODUCTION METHOD OF DETERGENT
AND PRODUCING APPARATUS

PRELIMINARY AMENDMENT

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

Prior to calculation of the filing fees and the examination of the above-identified patent application on the merits, the Examiner is respectfully requested to amend the claims as follows:

IN THE CLAIMS

Please amend the claims as follows:

Claim 6, line 2, change "claims 1 to 5" to --claim 1--.

Claim 7, line 2, change "claims 2 to 4" to --claim 2--.

Claim 9, line 2, delete "or 4".

Claim 10, line 2, change "claims 1 to 9" to --claim 1--.

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Claim 16, line 2, change "claims 1 to 14" to --claim 1--.

Claim 23, line 2, delete "or 22".

Claim 24, lines 1 and 2, change "claims 21 to 23" to --claim 21--.

25. (Amended) A washing machine provided with the detergent producing apparatus as set forth in claim 17 [claims 17 to 20 or the washing apparatus as set forth in claims 21 to 24].

26. (Amended) A dish washer provided with the detergent producing apparatus as set forth in claim 17 [claims 17 to 20 or the washing apparatus as set forth in claims 21 to 24].

Please add new claims 27 and 28 as follows:

--27. A washing machine provided with the washing apparatus as set forth in claim 21.

28. A dish washer provided with the washing apparatus as set forth in claim 21.--

REMARKS

By the above amendment, the claims have been amended to delete multiple dependency.

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527 Rec'd PCT/PTO 02 JUN 2000

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DESCRIPTION

PRODUCTION METHOD OF DETERGENT AND PRODUCING APPARATUS

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TECHNICAL FIELD

The present invention relates to a new washing process and a washing apparatus suitable to washing clothes, tableware, medical equipments and washing hands, etc.

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BACKGROUND OF THE INVENTION

Surfactant, such as chemicals and soap, has been heretofore been used for washing clothes, tableware, medical equipment, toilets, etc., however, there have been problems of causing chapping hands when washing, a safety issue on body by residual detergent on washing items, and residual harmful substances after a treatment of discharging water, etc.

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Inventors of the present invention proposed a method of washing washing items while softening washing water containing at least one of carbonate ion or bicarbonate ion and alkali metal ion (refer to PCT/JP99/00242, WO99/37414). This directs attention to the fact that a composite generated at the time of softening a solution containing alkali metal ion and

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carbonate ion and/or bicarbonate ion realizes
cleansing effect and adsorption effect, which shows
detergency comparable to or more excellent than the
conventional detergent such as surfactant and becomes
5 human body-friendly and environment-friendly.

However, when trying to produce a solution
containing alkali metal ion and carbonate ion and/or
bicarbonate ion as an undiluted detergent it is
necessary to use as its material a substance having a
10 problem on handle ability such as sodium hydroxide,
thus there has been a problem to carry out at home
from producing detergent to washing.

DISCLOSURE OF INVENTION

15 The present invention has as an object thereof to
provide a method of enabling to produce detergent only
by substances superior in being handled and an
apparatus therefor.

(1) According to a first aspect of the present
20 invention, a method of producing detergent includes a
step of electrolyzing a solution containing at least
one of carbonate and bicarbonate of alkali metal.

Namely, as shown in Fig. 1, by making a solution
of a substance containing at least one of carbonate
25 and bicarbonate of alkali metal (see Step 1 to 2 in

Fig. 1) and by electrolyzing the solution (see Step 3 in Fig. 1), an undiluted detergent can be obtained (see Step 4 in Fig. 1).

By electrolyzing a solution containing at least one of carbonate and bicarbonate of alkali metal, for example, a solution of substances superior in handle ability such as sodium carbonate, potassium carbonate, lithium carbonate, potassium hydrogen carbonate, sodium hydrogen carbonate, as a solution to be electrolyzed, it is possible to obtain an undiluted detergent containing alkali metal ion and carbonate ion and/or bicarbonate ion, and by washing as softening the same, it shows detergency comparable to or better than the conventional detergent, such as surfactant, and becomes human body-friendly and environment-friendly. Accordingly, a series of procedures from producing detergency to washing can be realized at home.

As alkali metal carbonate according to the present invention, for example, sodium carbonate Na_2CO_3 , potassium carbonate K_2CO_3 , lithium carbonate Li_2CO_3 , etc. can be listed, while as alkali metal bicarbonate, for example, potassium hydrogen carbonate KHCO_3 , sodium hydrogen carbonate NaHCO_3 , etc. can be listed.

Also, when making a solution of carbonate or bicarbonate of alkali metal, a variety of kinds of water may be used, such as tap water, well water, soft water, refined water, pure water, or mixed water of these, etc.

(2) Although, it is often the case that a pH, etc. of detergent to be used differ in accordance with a property of washing items, in the present invention, when producing detergent by electrolyzing a solution containing at least one of carbonate and bicarbonate of alkali metal, it is possible to adopt forms below in accordance with an aimed potential of hydrogen (pH=6 to 12) of the detergent.

As a first embodiment, cathode water or anode water obtained by electrolyzing by supplying the above solution to be electrolyzed at least to an anode chamber of an electrolyzing cell having a cathode chamber and an anode chamber separated by a diaphragm can be used as an undiluted detergent (see Fig. 4A). The cathode water obtained by this form becomes an alkaline undiluted detergent having a high pH.

In this case, as a second embodiment, when cathode water obtained by electrolyzing by supplying the above solution to be electrolyzed to both of the anode chamber and the cathode chamber of the

electrolyzing cell having a cathode chamber and an anode chamber separated by a diaphragm is used as an undiluted detergent, it is possible to obtain a highly concentrated undiluted detergent wherein rising of the pH is suppressed (see Fig. 4B).

Also, as a third embodiment, cathode water or anode water obtained by electrolyzing by supplying the above solution to be electrolyzed at least to an anode chamber of an electrolyzing cell having a cathode chamber and an anode chamber separated by a diaphragm or mixture of the both water is further added and dissolved at least one of carbonate and bicarbonate of alkali metal after completing the electrolysis and thus obtained solution can be used as an undiluted detergent (see Fig. 4C).

Furthermore, as a fourth embodiment, by electrolyzing by supplying the above solution to be electrolyzed at least to an anode chamber of an electrolyzing cell having a cathode chamber and an anode chamber separated by a diaphragm, and mixing the obtained cathode water or anode water after the electrolysis is completed, the thus obtained solution can be used as an undiluted detergent (see Fig. 4D).

In this case, as a fifth embodiment, it is also possible to use as an undiluted detergent mixture of

cathode water or anode water obtained by electrolyzing by supplying the solution to be electrolyzed to both of the anode chamber and the cathode chamber of the electrolyzing cell having a cathode chamber and an anode chamber separated by a diaphragm (see Fig. 4E).

In the fourth and fifth embodiments, since the mixture of the anode water and the cathode water becomes an undiluted detergent, a production amount of the obtained undiluted detergent becomes doubled, or otherwise, the capacity of the electrolysis cell can be halved.

The cathode water in the first embodiment, the cathode water in the second embodiment, the cathode water in the third embodiment, the mixed water in the fourth embodiment and the mixed water in the fifth embodiment have a pH of 9.5 to 12.0 and can be used as an alkaline undiluted detergent.

On the other hand, the anode water in the first embodiment and the anode water in the third embodiment have a pH of 6 to 8 and can be used as a neutral undiluted detergent.

In a method of producing detergent of the present invention, the pH and electric conductivity can be easily adjusted by suitably setting the conditions of electrolysis.

(3) The above undiluted detergent can be used for washing as it is or diluted (see Step 5 to 6 in Fig. 1. Hereinafter, also referred to as a diluted detergent A). An electric conductivity of the diluted detergent is 100mS/m or more, preferably, 150mS/m or more.

Also, a variety of washing aid agents for improving detergency, etc. can be added (see Step 9 in Fig. 1).

Namely, the above alkaline detergent can be added fatty acid or soap, such as oleic acid or oleic acid potassium, at the time of or after being diluted by water, to be used as detergent.

Also, the above neutral detergent can be added a variety of washing aid agents to be used as detergent, such as antisoil redeposition (for example, carboxyl methyl cellulose), nonionic surfactant (for example, sugar fatty acid ester, polyoxyethylene sorbitan fatty acid ester), dispersing agents (for example, carboxyl methyl cellulose) and water softening agents (for example, EDTA, citric acid).

Auxiliary/aid agents used in the present invention are emulsifier (surfactant) used for food processing and gum/thickening agent as food additives, and by not using the conventional surfactant for

washing, safer detergent can be provided. Furthermore, since the detergency is given to the electrolytic water obtained by electrolysis of a solution of alkali metal carbonate/bicarbonate, the surfactant can be made to be minimum thickness required for antisoil redeposition, and it becomes possible to reduce a burden on an environment by suppressing usage of organic substances.

(4) Note that the present invention may include a step of softening the detergent containing at least one of carbonate ion and bicarbonate ion and alkali metal ion, particularly the above undiluted detergent or the diluted detergent A (see Steps 7 to 8. Hereinafter, the obtained detergent will be also referred to as diluted detergent B).

In this case, it is preferable to adopt a means to make it contact solid carbonate composite which is water-insoluble or hard to be dissolved in water.

(5) Further, according to a second aspect of the present invention, an electrolysis cell wherein an anode chamber and a cathode chamber are separated by a diaphragm, a solution tank for making a solution by dissolving at least carbonate or bicarbonate of alkali metal in water, a detergent producing apparatus having a first supply means for supplying the solution in the

solution tank at least to the anode chamber of the electrolysis cell and a mixing means for mixing anode water and cathode water respectively generated in the anode chamber and the cathode chamber to make mixed electrolytic water after completion of the electrolysis are provided.

In this case, preferably, the mixing means comprises a water tank for storing anode water and cathode water after completion of the electrolysis and a second supply means for supplying the anode water and cathode water generated in said anode chamber and cathode chamber to said water tank.

Also, there is provided a detergent producing apparatus, comprising an electrolysis cell wherein an anode chamber and a cathode chamber separated by a diaphragm, a solution tank for making a solution by dissolving at least one of carbonate and bicarbonate of alkali metal in water, a first supply means for supplying the solution in said solution tank at least to the anode chamber of said electrolysis cell, a detergent tank for storing detergent discharged from said electrolysis cell, and a third supply means for supplying one of cathode water after completing the electrolysis generated in said cathode chamber and anode water after completing the electrolysis

generated in said anode chamber to said detergent tank.

In this case, it is preferable to comprise a means for adding and dissolving at least one of carbonate and bicarbonate of alkali metal to at least one of anode water generated in said anode chamber and cathode water generated in said cathode chamber.

(6) According to a third aspect of the present invention, there is provided a washing machine comprising a detergent producing apparatus for producing detergent by electrolyzing a solution containing at least one of carbonate and bicarbonate of alkali metal; a detergent tank for storing said detergent; a washing tub for washing; a means for supplying diluting water of said detergent to said washing tub; and a means for supplying said detergent from said detergent tank to said washing tub.

In this case, it is preferable to further comprises a judgement means for judging an amount of washing items and/or an amount of washing water in said washing tub and a setting means for setting the amount of washing items and the amount of washing water; and a control means for outputting to said detergent supply means a control signal for supplying the washing tub an appropriate amount of detergent for

washing based on an output signal from said judgement means or said setting means.

Furthermore, it is preferable to comprise a container for storing washing aid agents, a means for supplying washing aid agents from said container to said washing tub, and a control means for outputting to said supply means of washing aid agent a control signal for supplying an appropriate amount of the washing aid agents for washing to the washing tub.

(7) The above detergent producing apparatus or washing apparatus can be applied to a washing machine, dish washer, etc.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a view of processes of an embodiment of a method of producing detergent of the present invention.

Fig. 2 is a view of a pH range of detergent obtained by a method of producing detergent of the present invention.

Fig. 3 is a schematic view of an embodiment of a washing apparatus of the present invention.

Figs. 4A to 4E are views of respective use forms of an electrolysis cell of Fig. 3.

BEST MODE FOR CARRYING OUT THE INVENTION

First, an embodiment of applying a detergent producing apparatus of the present invention to a washing machine will be explained. Figure 3 is a schematic view of an example of a washing machine WM wherein a detergent producing apparatus of the present invention is applied, and details of an electrolysis cell 11 shown in the same figure will be explained with reference to Figs. 4A to 4E.

The detergent producing apparatus 1 of the present embodiment comprises a solution tank 12 for storing alkali metal sodium solution containing at least one of alkali metal carbonate and alkali metal bicarbonate (hereinafter, also referred to as a solution to be electrolyzed), an electrolysis cell 11 and a first supply system 13 for supplying the solution to be electrolyzed from the solution tank 12 to the electrolysis cell 11.

The solution tank 12 is supplied a substance containing at least one of alkali metal carbonate and alkali metal bicarbonate (sodium hydrogen carbonate in this example) from a container 16 storing the same and tap water, etc. from a tap water source, etc. via a supply system 17. An example below is for explaining a case of using sodium hydrogen carbonate.

As shown in Figs. 4A to 4E, the electrolysis

cell 11 is formed an inlet 111 for being introduced a solution to be electrolyzed and an outlet 112 for taking out generated electrolytic water, and an electrolysis chamber 113 is formed between the inlet 111 and the outlet 112.

Also, at the approximate center of the electrolysis chamber 113 is provided with a diaphragm 114 formed by a cation exchange film, and both electrolysis chambers 113a and 113c over the diaphragm 114 are respectively provided with a pair of electrode plates 115a and 115c facing to each other. Here, while not illustrated, the pair of electrode plates 115a and 115c are connected to a direct current power source, and one electrode plate 115a is to be applied the anode while the other electrode plate 115c is to be applied the cathode. Below, the electrolysis chamber 113a will be also referred to as an anode chamber, the electrolysis chamber 113c a cathode chamber, electrolytic water generated in the anode chamber an anode water, and electrolytic water generated in the cathode chamber a cathode water.

As the diaphragm 114, a variety of ion exchange films, nonionic selective films, multi-porous films may be used. These films are provided for preventing anode water generated around the anode and cathode

water generated around the cathode from being mixed.

In the case of using a cation exchange film as in the present example, less hydroxide ion generated in the cathode chamber 113c transmits to the anode chamber 113a, so that it is preferable because it becomes easy to refrain the pH of the obtained undiluted detergent of anode water from becoming alkaline, and to heighten the pH of the cathode water to be obtained to produce a strong alkaline undiluted detergent of cathode water.

As the electrode plates 115a and 115c, it is preferable to be configured by materials not melted by electricity. Specifically, for example, platinum family metals, titanium, etc. have excellent corrosion resistance and preferably used. The distance between the electrode plates 115a and 115c is 1mm to 6mm, more preferably, 5mm.

Further, to explain use forms the electrolysis cell 11 shown in Figs. 4A to 4E, in Fig. 4A, the anode chamber 113a is supplied a solution of sodium hydrogen carbonate from the solution tank 12, while the cathode chamber 113c is supplied tap water, etc. Both of anode water generated in the anode chamber 113a and cathode water generated in the cathode chamber 113c may be used as undiluted detergent. According to this use

form, little hydroxide ion generated in the cathode chamber 113c transmits to the anode chamber 113a, so it is possible to refrain the pH of the undiluted detergent of anode water from becoming alkaline, and it becomes easy to heighten the pH of cathode water to be obtained and to produce a strong alkaline undiluted detergent of cathode water.

On the other hand, in the use form shown in Fig. 4B, although sodium hydrogen carbonate solution is supplied to both the anode chamber 113a and the cathode chamber 113c from the solution tank 12, only cathode water generated in the cathode chamber 113c is used as undiluted detergent. In this case, since a sodium hydrogen carbonate solution is supplied to the cathode chamber 113c, the undiluted detergent of cathode water to be obtained is suppressed not to rise the pH, so that weak alkaline undiluted detergent can be obtained and highly concentrated undiluted detergent can be generated.

Also, the use form shown in Fig. 4C is a modified example of the one shown in Fig. 4A, and the anode chamber 113a is supplied sodium hydrogen carbonate solution from the solution tank 12 while the cathode chamber 113c is supplied tap water, etc., and obtained anode water and cathode water are respectively further

added with at least one of sodium carbonate and sodium hydrogen carbonate to become an undiluted detergent. According to this use form, it is possible to adjust the pH and concentration of the anode water and cathode water respectively obtained in the anode chamber 113a and the cathode chamber 113c after the electrolysis.

Furthermore, the use form shown in fig. 4D is also a modified example of the one shown in Fig. 4A, wherein also the anode chamber 113a is supplied sodium hydrogen carbonate solution from the solution tank 12 while the cathode chamber 113c is supplied tap water, etc., but the obtained anode water and the cathode water are mixed to be an undiluted detergent. According to this use form, since all of the anode water and the cathode water are used, the production amount of the undiluted detergent to be obtained is doubled, or otherwise, the capacity of the electrolysis cell 11 may be halved.

Also, the use form shown in Fig. 4E is a modified example of the one shown in Fig. 4D, wherein both of the anode chamber 113a and the cathode chamber 113c are supplied sodium hydrogen carbonate solution from the solution tank 12, and the obtained anode water and the cathode water are mixed to be an undiluted

detergent. According to this use form, all of the anode water and the cathode water are used, so the production amount of the undiluted detergent to be obtained is doubled, or the capacity of the electrolysis cell 11 may be halved.

As explained above, according to the electrolysis 11 of the present invention, a variety of aimed undiluted detergent can be obtained by suitably changing the use form. The states are schematically shown in Fig. 2.

Returning to Fig. 3, the first supply system 13 is provided with a pipe 131 for connecting a solution tank 12 to the inlet 111 of the electrolysis cell 11 and a pump 132 for sending by pressure the solution to be electrolyzed in the solution tank 12 to the electrolysis cell 11.

Furthermore, the detergent producing apparatus 1 of the present embodiment comprises a detergent tank 15 for storing electrolytic water generated in the anode chamber 113a and/or the cathode chamber 113c of the electrolysis cell 11, a second supply system 14 for supplying the electrolytic solution from the electrolysis cell 11 to the detergent tank 15, and a diluting means 18 for diluting the undiluted detergent generated in the electrolysis cell 11.

The second supply system 14 is comprised by a pipe 141 for connecting the outlet 112 of the electrolysis cell 11 to the detergent tank 15 and a pump 142 provided on the pipe 141 for sending by pressure the electrolytic solution generated in the electrolysis cell 11 to the detergent tank 15.

Note that in the use form shown in Fig. 4C, when adding sodium hydrogen carbonate to the anode water or cathode water generated in the electrolysis cell 11 later on, it is sufficient to supply it from the container 16 shown in Fig. 3.

Also, the diluting means 18 is comprised by a supply pipe 181 for supplying diluting water from a not shown tap water source to the detergent tank 15 and a pump 182 by which the undiluted detergent is diluted by a predetermined diluting rate to become diluted detergent A.

The above detergent producing apparatus 1 is provided to a washing machine body 2 having a washing tub 21. It further comprises a third supply system 22 for supplying electrolytic water (diluted detergent A) stored in the detergent tank 15 to the washing tub 21 via a water softening filter 23. The third supply system 22 is comprised by a pipe 221 for connecting the detergent tank 15 to the water softening filter 23

and a pump 222 provided on the pipe 221 for sending by pressure the diluted detergent A stored in the detergent tank 15 to the water softening filter 23.

The water softening filter 23 is provided in this example for softening the undiluted detergent (see Step 4 in Fig. 1) as it is obtained by the detergent producing apparatus 1 or diluted detergent A after diluting (see Step 6 in Fig. 1).

In the water softening filter 23, inside its casing is filled with solid hydroxide composite which is insoluble or hard to be dissolved in water, for example, calcium carbonate or calcium phosphate, and by making the above undiluted detergent and diluted detergent contact such carbonate composites, calcium ion and magnesium ion included in the undiluted detergent and diluted detergent are reduced as calcium carbonate and magnesium carbonate, and thereby, the detergent can be made to be low in hardness. Note that the carbonate composite may be in a suitably granulated ball shape or pelletized form other than powder and a crushed shape, and may include filling agents and amount increasing agents other than carbonate composite. Also, the solid carbonate composite is sufficient if at least the surfaces thereof are carbonate composite, and may be a compound

body wherein a suitable core body is covered with carbonate composite.

Returning back to Fig. 3, the washing tub 21 is provided with a fourth supply system 24 for supplying tap water, etc. for diluting the detergent, and the fourth supply system 24 is configured by a pipe 241, a pump 242 and a not shown tap water supplying source.

Furthermore, the washing machine WM of the present embodiment is provided with a washing aid agent tank 25 for storing a variety of washing aid agents, such as antisoil redeposition (for example, carboxyl methyl cellulose), nonionic surfactant (for example, sugar fatty acid ester, polyoxyethylene sorbitan fatty acid ester), dispersing agents (for example, carboxyl methyl cellulose) and water softening agents (for example, EDTA, citric acid), and a fifth supply system 26 for supplying the washing aid agents stored in the washing aid agent tank 25 to the washing tub 21. The fifth supplying system 26 is configured by a pipe 261 and a pump 262.

Furthermore, the washing machine WM of the present embodiment is provided as a control system with a judgement/setting means 27 for detecting and judging or manually setting an amount of washing items put in the washing tub 21 or an amount of washing

water filled in the washing tub 21 and a control means 28 for controlling the operations of the pumps 222 and 262 based on the amounts of washing items or washing water input to the means 27. As a result, detergent and washing aid agents in accordance with the washing load are supplied respectively from the detergent tank 15 and the washing aid agent tank 25 to the washing tub 21.

Next, an example of washing process using the above washing machine WM will be explained.

First, an anode of a direct current power source of the detergent producing apparatus 1 is connected to the electrode plate 115a, while a cathode is connected to the electrode plate 115c, and a direct current voltage is applied to the both electrode plates 115a and 115c. Then, the pump 132 is operated to introduce sodium hydrogen carbonate solution as the solution to be electrolyzed from the solution tank 12 to the inlet 111. As a result, electrolysis is carried out in both of the electrolysis chambers 113a and 131c, and after a certain period of time, electrolytic solution is discharged from the respective outlets 112. These electrolytic waters are supplied to the detergent tank 15 by the pump 142 via the pipe 141, mixed during the time and becomes an undiluted detergent of the present

invention.

The undiluted detergent stored in the detergent tank 15 is diluted by the diluting means 18, and then supplied to the water softening filter 23, wherein it is softened, and supplied to the washing tub 21 of the washing machine WM.

At this time, amounts of detergent and washing aid agents to be supplied are controlled in accordance with the amount of washing items. Namely, when the judging means automatically detects or setting means 27 is manually input the amount of washing items (for example, the weight, volume, etc.) put in the washing tub 21 and the amount of tap water poured in the washing tub 21, a signal is sent to the control means 28 and a signal of operation time, etc. in accordance with the washing load is sent therefrom to the pumps 222 and 262. As a result, the washing tub 21 is supplied an appropriate amount of detergent and washing aid agents in accordance with the washing load.

A specific example of producing detergent by the present invention will be explained next.

Embodiment 1 (Fig. 4A)

A saturated solution of sodium hydrogen carbonate prepared by dissolving and diluting 100g of sodium

hydrogen carbonate in 1 litter of tap water (municipal tap water in Fujisawa city, pH 7.2, EC 15.5mS/m, water temperature 24.5°C) was supplied to the anode chamber 113a of the batch type electrolysis cell 11 (a capacity of the anode chamber and the cathode chamber are both 0.5 litter) shown in Fig. 4A, and the above tap water was supplied to the cathode chamber 113c shown in the same figure. Then, electrolysis was carried out by applying a direct current voltage so that a constant current of 20A flows to both the electrode plates 115a and 115c, and pH and electric conductivity EC of an undiluted solution of cathode water obtained at every five minutes and a diluted solution by diluting the same to be thirty times (30 litters) were measured. Measurement of the diluted water was made after mixing for one minute. The result will be shown in Table 1.

Note that a pH was measured by using a pH meter (trade name of D-13, manufactured by Horiba Ltd.), an EC was measured by using an EC meter (trade name of CM-14P, manufactured by TOA Corporation). The mark * of EC in the table indicates it exceeded the measurable limit (1999mS/m or less).

Both of the undiluted detergent and diluted detergent A obtained in the present embodiment become

alkaline having a pH of 10.5 or more, and those which had a long electrolysis time became detergent having strong alkaline and the EC value of 100mS/m or more, so that it becomes preferable to be used as detergent for non fibrous washing items, such as tableware.

5

[illegible]

Table 1

	undiluted electrolytic solution		diluting water	
	pH	EC (mS/m)	pH	EC (mS/m)
before electrolysis	7.23	15.5	-	-
after 3 min.	12.64	2000 or more *	10.53	47.1
after 5 min.	12.88	2000 or more *	10.92	59.6
after 10 min.	13.05	2000 or more *	11.34	87.2
after 15 min.	13.20	2000 or more *	11.79	133.0
after 20 min.	13.35	2000 or more *	12.26	180.3

Embodiment 2 (Fig. 4B)

A solution prepared by dissolving and diluting
36g of sodium hydrogen carbonate in 1 liter of tap

water (municipal tap water in Fujisawa city, pH 7.3, EC 17.9mS/m, water temperature 20.2°C) was supplied to the cathode chamber 113c of the batch type electrolysis cell 11 (a capacity of the anode chamber and the cathode chamber are both 1 liter) shown in Fig. 4B, and saturated solution of sodium hydrogen carbonate was supplied to the anode chamber 113a. Then, electrolysis was carried out by applying a direct current voltage so that a constant current of 15A flows to both of the electrode plates 115a and 115c, and a pH and electric conductivity EC of an undiluted solution of cathode water obtained at every ten minutes and a diluted solution by diluting the same to be thirty times (30 liters) were measured. Measurement of the diluted water was made after mixing for one minute. The result will be shown in Table 2.

Both of the undiluted detergent and diluted detergent A obtained in the present embodiment become weak alkaline of a pH of 9.0 to 10.5, and the EC value of 100mS/m or more, so that it becomes preferable to be used as detergent for fibrous washing items, such as cotton, hemp, rayon, polynosic, polyester, nylon and acryl.

Table 2

	undiluted electrolytic water		diluting water	
	pH	EC (mS/m)	pH	EC (mS/m)
before electrolysis	8.02	2000 or more *	8.20	120.3
after 10 min.	9.36	2000 or more *	9.52	140.3
after 20 min.	9.65	2000 or more *	9.94	168.0
after 30 min.	9.98	2000 or more *	10.23	196.9
after 36 min.	10.20	2000 or more *	10.44	204.0

Embodiment 3 (Fig. 4E)

A solution prepared by dissolving and diluting 36g of sodium hydrogen carbonate in 2 liters of tap water (municipal tap water in Fujisawa city, pH 7.3, EC 18.5mS/m, water temperature 20.6°C) was divided to be 1 liter and respectively supplied to the anode

chamber 113a and the cathode chamber 113c of the batch type electrolysis cell 11 (a capacity of the anode chamber and the cathode chamber are both 1 litter) shown in Fig. 4E. Then, electrolysis was carried out by applying a direct current voltage so that a constant current of 15A flows to both the electrode plates 115a and 115c, and a pH and electric conductivity EC of mixture of an undiluted solution of anode water and cathode water obtained at every ten minutes and a diluted solution by diluting the same to be thirty times (30 litters) were measured. Measurement of the diluted water was made after mixing for one minute. The result will be shown in Table 3.

Both of the undiluted detergent and diluted detergent A obtained in the present embodiment became weak alkaline of a pH of 8.5 to 10.5, and the EC value of 100mS/m or more, so that it becomes preferable to be used as detergent for fibrous washing items, such as cotton, hemp, rayon, polynosic, polyester, nylon and acryl.

Table 3

	undiluted electrolytic solution		diluting water	
	pH	EC (ms/m)	pH	EC (ms/m)
before electrolysis	8.06	1460	8.13	121.3
after 5 min.	8.72	1455	8.84	119.3
after 15 min.	9.56	1492	9.68	120.9
after 25 min.	10.21	1531	10.25	126.7

Embodiment 4 (Fig. 4E)

A solution prepared by dissolving and diluting 72g of sodium hydrogen carbonate in 1 liter of tap water (municipal tap water in Fujisawa city, pH 7.2, EC 15.5mS/m, water temperature 24.5°C) was divided to be 0.5 liter and respectively supplied to the anode chamber 113a and the cathode chamber 113c of the batch

type electrolysis cell 11 (a capacity of the anode chamber and the cathode chamber are both 1 litter) shown in Fig. 4. Then, electrolysis was carried out by applying a direct current voltage so that a constant current of 20A flows to both the electrode plates 115a and 115c, and a pH and electric conductivity EC of an undiluted solution of anode water obtained at every ten minutes and a diluted solution by diluting the same to be thirty times (30 litters) were measured. Measurement of the diluted water was made after mixing for one minute. The result will be shown in Table 4.

Both of the undiluted detergent and diluted detergent A obtained in the present embodiment became neutral of a pH of 7.0 to 8.0, and the EC value of 100mS/m or more, so that it becomes preferable to be used as detergent for fibrous washing items, such as silk, wool, cupra, acetate.

Table 4

	undiluted electrolytic solution		diluting water	
	pH	EC (ms/m)	pH	EC (ms/m)
before electrolysis	8.02	-	-	-
after 20 min.	7.70	2000 or more *	7.82	164.5
after 30 min.	7.70	2000 or more *	7.85	133.6

Next, an embodiment of comparing detergency on a various kinds of stains will be explained by using the detergent produced by using the method of producing detergent of the present invention and commercially available detergent.

Embodiment 5 (weak alkaline detergent)

In the same way as in the Embodiment 3, a solution prepared by dissolving and diluting 22.5 of sodium hydrogen carbonate in 0.5 litter of tap water (municipal tap water in Fujisawa city, pH 7.2, EC 15.5mS/m, water temperature 24.5°C) was supplied to the

anode chamber 113a and the cathode chamber 113c of the batch type electrolysis cell 11 (a capacity of the anode chamber and the cathode chamber are both 0.5 litter) shown in Fig. 4E. Then, electrolysis was carried out by applying a direct current voltage so that a constant current of 20A flows to both the electrode plates 115a and 115c for 17 minutes. Thus obtained anode water and cathode water were mixed and 1 litter of mixed water was obtained.

A washing tub of a domestic washing machine of double-tub type (trade name of ES-25E, 2.5kg type, manufactured by Sharp Corp.) was filled with 30 litters of tap water and put in 1000cc of the above mixed water detergent (diluting rate = 30 times). The diluted detergent had a pH of 10.2, EC value of 164.5mS/m, and a water temperature of 25°C.

A standard stained fabric with "dirt on a collar", and "mixed stain of china ink and olive oil", "blood", "cacao butter (animal and vegetable oil)", "red wine", and "mixed stain of blood, milk and china ink" being allowed to adhere to cotton fabric samples, respectively (EMPA101, 111, 112, 114, 115 and 116), were washed with the washing machine for 12 minutes, spin-dried and dried by a drier.

The detergency ratio of the respective stained

fabrics before and after washing is shown in Table 5. Note that the "detergency ratio" was calculated by the formula below.

5 Detergency ratio % = (whiteness index of stained fabric after washing - whiteness index of stained fabric before washing) ÷ (whiteness index of unstained fabric - whiteness index of stained fabric before washing) × 100

10

 Here, the "whiteness index" is an average of ten points on two sides of the artificially stained fabric measured by a whiteness index measure (trade name of CR-14, Whiteness Index Color Reader, manufactured by Minolta Co., Ltd.).

15

Comparative Example 1

 As an comparative example of the embodiment 5, the same stained fabrics as in the Embodiment 5 were washed by using a commercially available synthetic detergent for washing (Attack (registered trademark), Kao Corporation) and a whiteness index and the detergency ratio were calculated. The results are shown in Table 5.

20

Table 5

kind of stained fabric		detergency ratio	
stained fabric	stain	embodiment 5	comparative example 1
standard stained fabric	dirt on collar	49.7	44.5
EMPA101	china ink and olive oil	11.2	8.3
EMPA111	blood	81.1	44.7
EMPA112	cacao	19.6	11.7
EMPA114	red wine	13.8	19.9
EMPA116	mixed stain of blood, milk and china ink	15.2	13.6

From the result, it was confirmed that the weak alkaline detergent (mixed electrolytic water) obtained by the present invention had detergency comparable to

or better than the commercially available synthetic detergent. Especially, it is remarkably improved as to blood stain. Note that the detergent of the fifth embodiment had no problems at all concerning safety and treatment of discharging water after washing.

Embodiment 6 (neutral detergent)

A solution prepared by dissolving and diluting 36g of sodium hydrogen carbonate in 1 liter of tap water (municipal tap water in Fujisawa city, pH 7.2, EC 15.5mS/m, water temperature 24.5°C) was supplied to the anode chamber 113a and the cathode chamber 113c of the batch type electrolysis cell 11 (a capacity of the anode chamber and the cathode chamber are both 1 liter) shown in Fig. 4C, and electrolysis was carried out by applying a direct current voltage so that a constant current of 15A flows to both the electrode plates 115a and 115c for 36 minutes. When measuring a pH and EC value of thus obtained anode water, pH=7.06 and EC=971mS/m.

The anode water was further added with 52g of sodium hydrogen carbonate and additionally added with 3g of cane sugar fatty acid ester and 2g of carboxyl methyl cellulose.

A washing tub of a domestic automatic washing machine (trade name of AW-C60VP, 6kg type,

manufactured by Toshiba Corporation) was filled with 31 liters of tap water and put in 1000cc of the above detergent (diluting rate = 31 times). The diluted detergent had a pH of 8.0, EC value of 175.5mS/m, and a water temperature of 20.1°C,

A standard stained fabric with "dirt on collar", and "mixed stain of china ink and olive oil", "blood", "cacao butter (animal and vegetable oil)", "red wine", and "mixed stain of blood, milk and china ink" being allowed to adhere to cotton fabric samples, respectively (EMPA101, 111, 112, 114, 115 and 116), were washed by setting the water current switch to pressing washing course for 3 minutes (soaked for 5 minutes before washing), rinsed for two times, spin-dried for 4 minutes and dried by a drier.

The detergency ratio of the respective stained fabrics before and after washing is shown in Table 6. note that the "detergency ratio" and "whiteness" were measured and calculated in the same way as in the fifth embodiment.

Comparative Example 2

As a comparative example of Embodiment 6, the same stained fabric as in the Embodiment 6 was washed by using a commercially available neutral detergent for washing (Acron, Lion Corporation) and the

:

Table 6

kind of stained fabric		detergency ratio	
stained fabric	stain	embodiment 6	comparative example 2
standard stained fabric	dirt on collar	13.8	12.5
EMPA101	china ink and olive oil	5.3	4.5
EMPA111	blood	52.5	34.9
EMPA112	cacao	3.9	6.0
EMPA114	red wine	24.3	19.7
EMPA116	mixed stain of blood, milk and china ink	10.2	8.3

From the result, it was confirmed that the neutral detergent obtained by the present invention had detergency comparable to or better than the commercially available neutral detergent. Especially,

it is remarkably improved as to blood stain. Note that the detergent of the sixth embodiment had no problems at all concerning safety and treatment of discharging water after washing.

CLAIMS

1. A method of producing detergent including a step of electrolyzing a solution containing at least one of carbonate and bicarbonate of alkali metal as a solution to be electrolyzed.

2. The method of producing detergent as set forth in claim 1, wherein said solution to be electrolyzed is supplied at least to an anode chamber of an electrolysis cell having a cathode chamber and an anode chamber separated by a diaphragm and electrolyzed, and the obtained cathode water or anode water is used as detergent.

3. The method of producing detergent as set forth in claim 2, wherein said solution to be electrolyzed is supplied to both of a cathode chamber and an anode chamber of an electrolysis cell having a cathode chamber and an anode chamber separated by a diaphragm and electrolyzed, and the obtained cathode water is used as detergent.

4. The method of producing detergent as set forth in claim 1, wherein said solution to be electrolyzed is supplied at least to an anode chamber of an electrolysis cell having a cathode chamber and an anode chamber separated by a diaphragm and electrolyzed, and the obtained cathode water, anode

water, or mixture of the two is further added and dissolved at least one of carbonate and bicarbonate of alkali metal after the electrolysis is completed, and thus obtained solution is used as detergent.

5 5. The method of producing detergent as set forth in claim 1, wherein said solution to be electrolyzed is supplied at least to an anode chamber of an electrolysis cell having a cathode chamber and an anode chamber separated by a diaphragm and
10 electrolyzed, and the obtained cathode water and anode water are mixed after completing the electrolysis, and thus obtained solution is used as detergent.

 6. A method of producing detergent as set forth in claims 1 to 5, including a step of diluting
15 said detergent with water.

 7. The method of producing detergent as set forth in claims 2 to 4, wherein said cathode water or the mixed water of said cathode water and anode water has a pH of 9.5 to 12.0.

20 8. The method of producing detergent as set forth in claim 7, wherein at the time of diluting or after diluting said detergent, fatty acid or soap is added, and thus obtained solution is used as detergent.

25 9. The method of producing detergent as set

forth in claim 2 or 4, wherein said anode water has a pH of 6 to 8.

10. The method of producing detergent as set forth in claims 1 to 9 wherein the electric
5 conductivity of said detergent is 100mS/m or more.

11. The method of producing detergent as set forth in claim 9, wherein said detergent includes washing aid agents.

12. The method of producing detergent as set
10 forth in claim 11, wherein said washing aid agents include an antisoil redeposition.

13. The method of producing detergent as set forth in claim 11, wherein said washing aid agents include at least one of fatty acid base ester and
15 dispersion agent as nonionic surfactant.

14. The method of producing detergent as set forth in claim 11, wherein said washing aid agents include water softening agent.

15. A method of producing detergent including a
20 step of making a solution containing at least one of carbonate ion and bicarbonate ion and alkali metal ion contact solid carbonate composite which is insoluble or hard to be dissolved in water.

16. The method of producing detergent as set
25 forth in claims 1 to 14, including a step of making

said detergent contact solid carbonate composite which is insoluble or hard to be dissolved in water.

17. A detergent producing apparatus, comprising:

5 an electrolysis cell having an anode chamber and a cathode chamber and a diaphragm for separating the two;

10 a solution tank for making a solution by dissolving at least one of carbonate and bicarbonate of alkali metal in water;

a first supply means for supplying a solution in said solution tank at least to the anode chamber of said electrolysis cell; and

15 a mixing means for mixing after completion of the electrolysis anode water and cathode water respectively generated in said anode chamber and said cathode chamber to make mixed electrolytic water.

18. The detergent producing apparatus as set forth in claim 17, wherein said mixing means comprises
20 a water tank for storing anode water and cathode water after completing said electrolysis and a second supply means for supplying the anode water and cathode water generated in said anode chamber and cathode chamber to said water tank.

25 19. A detergent producing apparatus,

comprising:

an electrolysis cell wherein an anode chamber and a cathode chamber separated by a diaphragm;

5 a solution tank for making a solution by dissolving at least one of carbonate and bicarbonate of alkali metal in water;

10 a first supply means for supplying a solution in said solution tank at least to the anode chamber of said electrolysis cell;

a detergent tank for storing detergent discharged from said electrolysis cell; and

15 a third supply means for supplying one of cathode water after completing the electrolysis generated in said cathode chamber and anode water after completing the electrolysis generated in said anode chamber to said detergent tank.

20 20. The detergent producing apparatus as set forth in claim 19, comprising a means for adding and dissolving at least one of carbonate and bicarbonate of alkali metal to at least one of anode water generated in said anode chamber and cathode water generated in said cathode chamber.

25 21. A washing machine comprising a detergent producing apparatus for producing detergent by

electrolyzing a solution containing at least one of carbonate and bicarbonate of alkali metal;

a detergent tank for storing said detergent;

5 a washing tub for washing;

a means for supplying diluting water of said detergent to said washing tub; and

a means for supplying said detergent from said detergent tank to said washing tub.

10 22. The washing machine as set forth in claim 21, further comprising a filter filled with solid carbonate composite which is insoluble or hard to be dissolved in water between said detergent tank and said washing tub.

15 23. The washing machine as set forth in claim 21 or 22, further comprising:

a judgement means for judging an amount of washing items and/or an amount of washing water in said washing tub and a setting means for setting the amount of washing items and the amount of washing water; and

20 a control means for outputting to said detergent supply means a control signal for supplying the washing tub an appropriate amount of detergent for washing based on an output signal from said judgement

25

means or said setting means.

24. The washing machine as set forth in claims 21 to 23, further comprising a container for storing washing aid agents, a washing aid agents supply means for supplying the washing aid agents from said container to said washing tub, and a control means for outputting to said washing aid agent supply means a control signal for supplying an appropriate amount of the washing aid agents for washing to the washing tub.

25. A washing machine provided with the detergent producing apparatus as set forth in claims 17 to 20 or the washing apparatus as set forth in claims 21 to 24.

26. A dish washer provided with the detergent producing apparatus as set forth in claims 17 to 20 or the washing apparatus as set forth in claims 21 to 24.

Abstract

5 A solution containing at least one of carbonate
and bicarbonate of alkali metal, for example, a sodium
hydrogen carbonate solution, as a solution to be
electrolyzed is electrolyzed, and the obtained
electrolytic water is used as an undiluted detergent.
In the electrolysis process, a sodium hydrogen
carbonate solution is supplied at least to an anode
10 chamber of an electrolysis cell having a cathode
chamber and an anode chamber separated by a diaphragm
to carry out electrolysis, and the obtained cathode
water or anode water is used as an undiluted
detergent; or a sodium hydrogen carbonate solution is
15 supplied to both of an anode chamber and a cathode
chamber of the electrolysis cell to carry out
electrolysis, and the obtained cathode water is used
as an undiluted detergent; or a sodium hydrogen
carbonate solution is supplied at least to an anode
20 chamber of the electrolysis cell to carry out
electrolysis, and the obtained cathode water or anode
water is further added and dissolved sodium hydrogen
carbonate and the obtained solution is used as an
undiluted detergent; or a sodium hydrogen carbonate
25 solution is supplied at least to an anode chamber of

5

[illegible]

FIG. 1

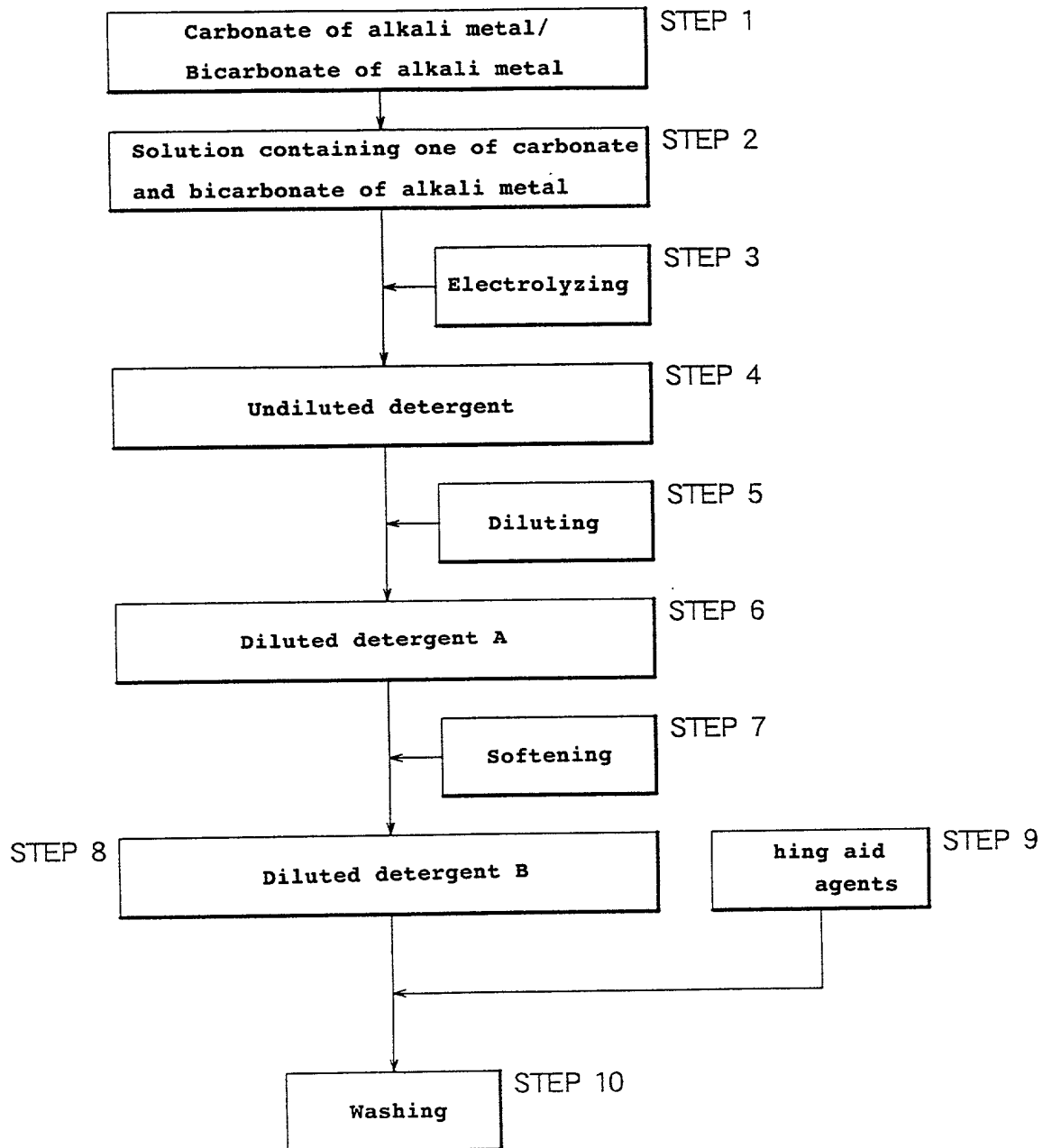


FIG. 2

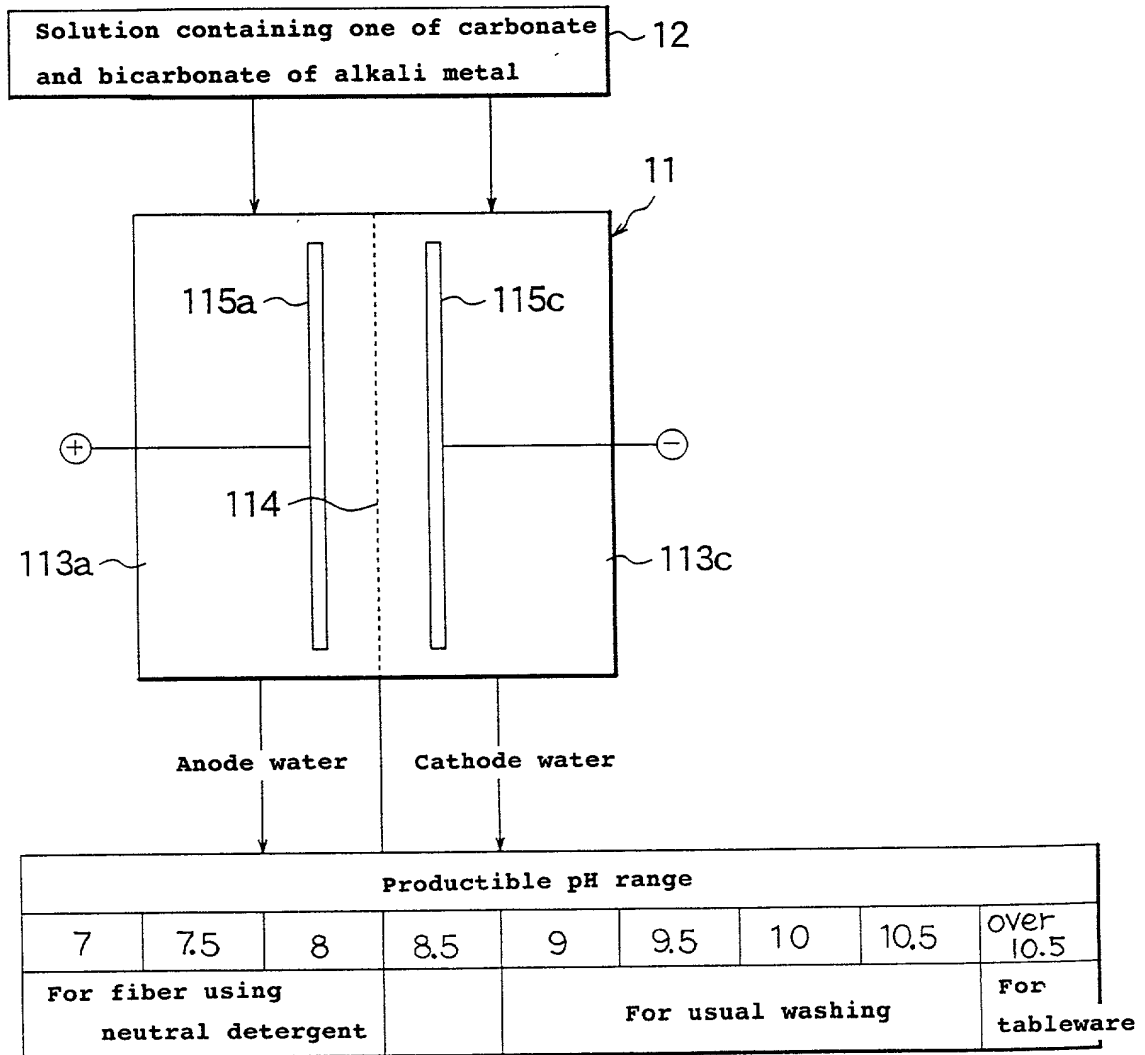


FIG. 3

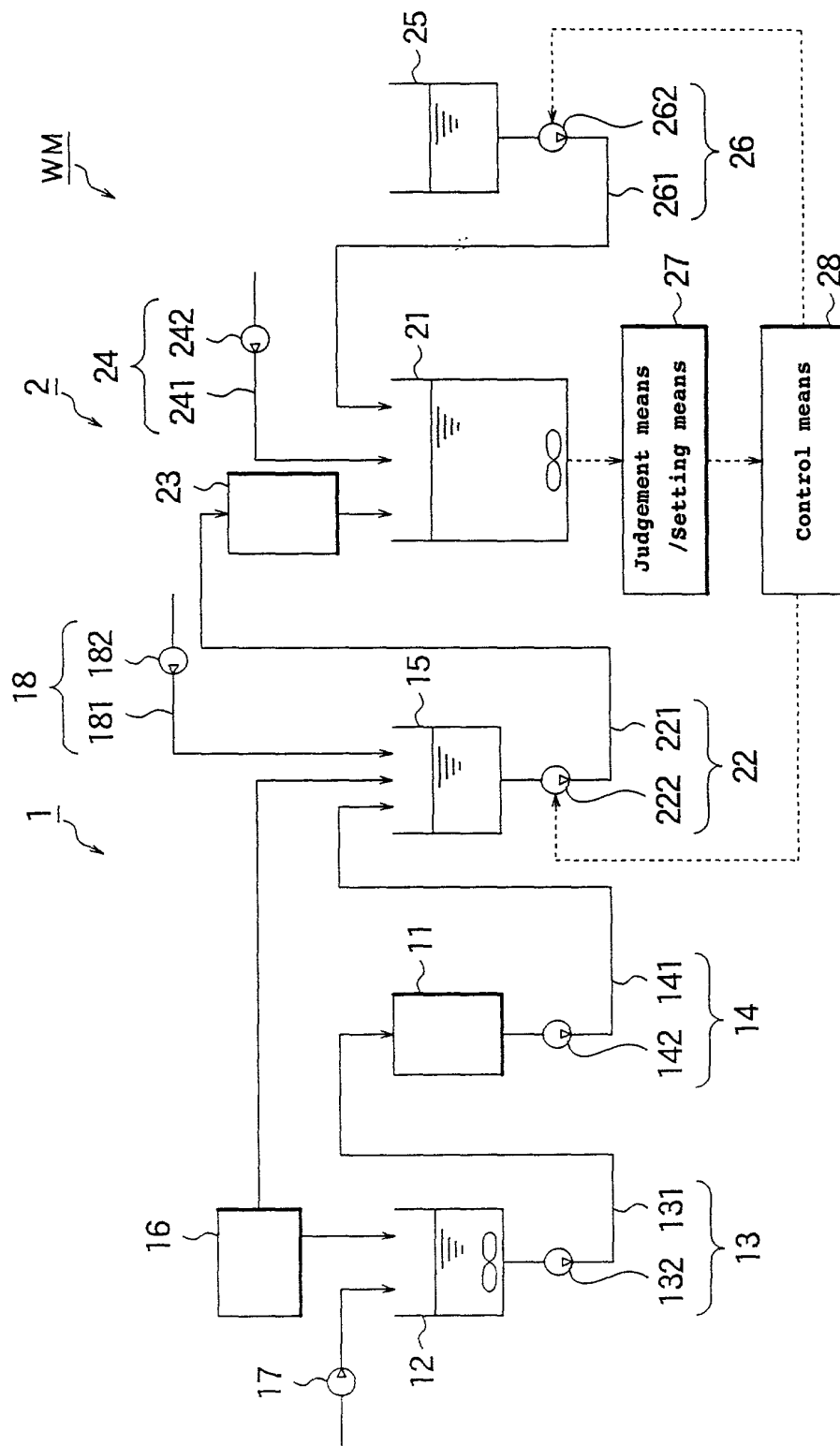


FIG. 4A

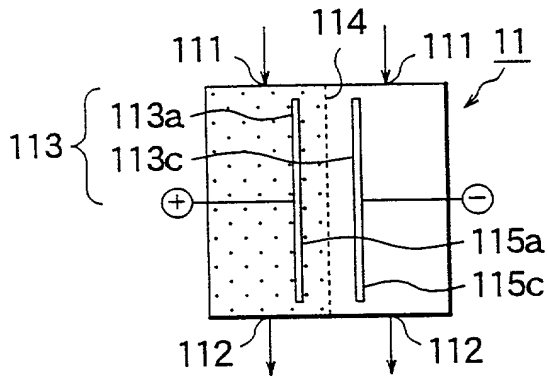


FIG. 4B

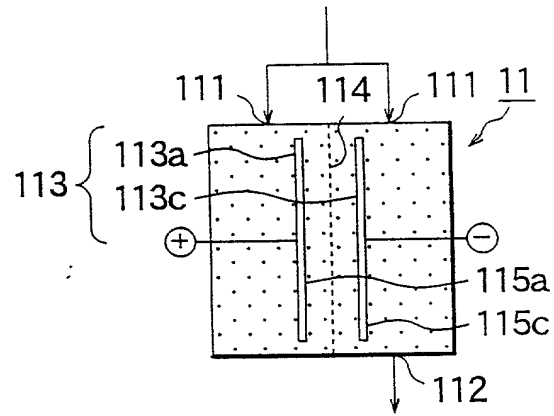


FIG. 4C

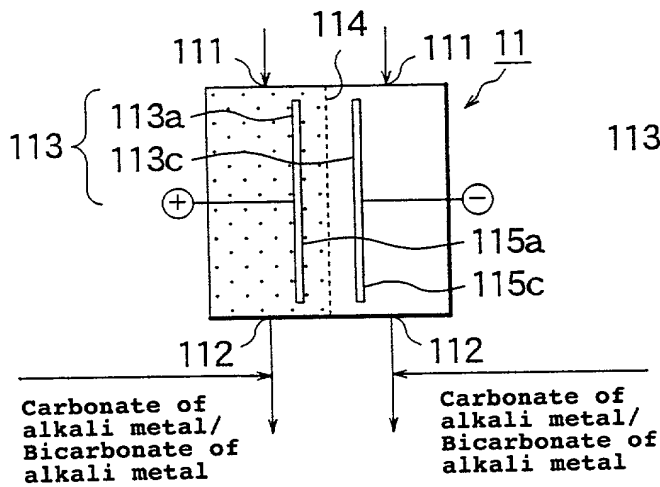


FIG. 4D

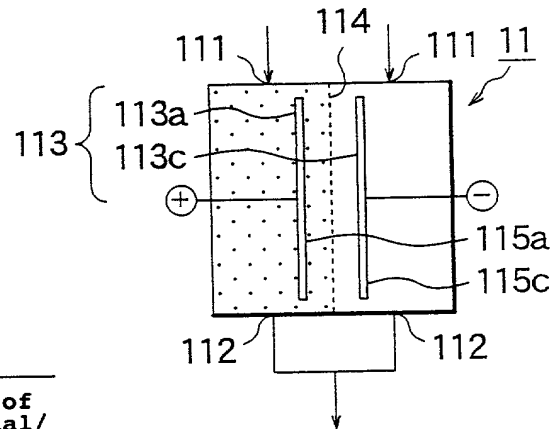
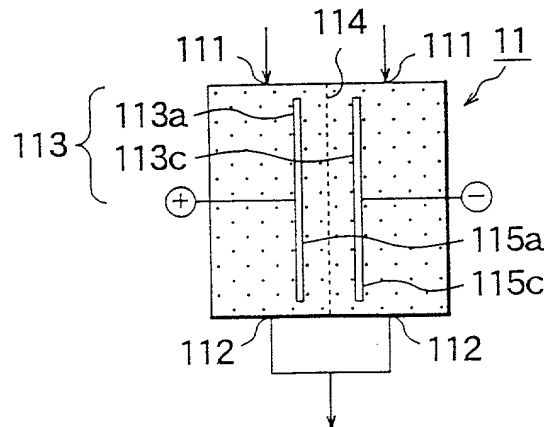


FIG. 4E



Declaration and Power of Attorney For Utility or Design Patent Application

特許出願宣言書

Japanese Language Declaration

私は、下欄に氏名を記載した発明者として、以下のとおり
宣言する：

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおり
であり、

名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、
最初にして唯一の発明者である(一人の氏名のみが下欄に記載されている
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上記発明の明細書(下記の欄でX印がついていない場合は、
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☐ 年 月 日に提出され、
米国出願番号 _____ とし、
(該当する場合) 年 月 日に訂正されました。又は、
特許協定条約国際出願番号 _____ とし、
(該当する場合) 年 月 日に訂正されました。

私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討
し、理解したことを陳述する。

私は、連邦規則法典第37編第1条第56項に定義されるとおり、特許資
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私は合衆国法典第35部第119条(a-d)項又は第365条(b)項に基づく、下
記の外国特許出願又は発明者証出願、或いは第365条(a)項に基づく、少な
くとも米国以外の1ヶ国を指名したPCT国際出願の外国優先権を主張し、
更に優先権の主張に係わる基礎出願の出願日前の出願日を有する外国特許
出願、又は発明者証出願或いはPCT国際出願を以下に“なし”の箱に印を
つけることにより明記する：

Prior foreign applications
先の外国出願

10-282767	Japan	5/October/1998
(Number)	(Country)	(Day/Month/Year Filed)
(番号)	(国名)	(出願の年月日)
11-211811	Japan	27/July/1999
(Number)	(Country)	(Day/Month/Year Filed)
(番号)	(国名)	(出願の年月日)

☐ その他の外国特許出願番号は別紙の追補優先権欄にて記載する。

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated
below next to my name.

I believe I am the original, first and sole inventor (if only one name is
listed below) or an original, first and joint inventor (if plural names
are listed below) of the subject matter which is claimed and for
which a patent is sought on the invention entitled

PRODUCTION METHOD OF DETERGENT AND

PRODUCING APPARATUS

the specification of which is attached hereto unless the following
box is checked:

☒ was filed on October 4, 1999 as
United States Application Number _____
and was amended on _____ (if applicable) or,
PCT International Application Number PCT/JP99/05447
and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents
of the above identified specification, including the claims, as
amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to
patentability as defined in Title 37, Code of Federal Regulations,
§1.56.

I hereby claim foreign priority under Title 35, United States Code
§119(a-d) or §365(b) of any foreign application(s) for patent or
inventor's certificate, or §365(a) of any PCT international application
which designated at least one country other than the United States,
listed below. I have also identified below, by checking the "No"
box, any foreign application for patent or inventor's certificate, or of
any PCT international application having a filing date before that of
the application on which priority is claimed:

Priority claimed
優先権の主張
☒ Yes
あり
☒ Yes
あり
☐ No
なし
☐ No
なし

☐ Additional foreign application numbers are listed on a
supplemental priority sheet attached hereto.

Japanese Language Utility or Design Patent Application Declaration

私は、合衆国法典第35部第119条(e)項に基づく、下記の合衆国仮特許出願の利益を主張する。

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.

(Application No.)
(出願番号)

(Day/Month/Year Filed)
出願の年月日

(Application No.)
(出願番号)

(Day/Month/Year Filed)
出願の年月日

(Application No.)
(出願番号)

(Day/Month/Year Filed)
出願の年月日

☐ その他の合衆国仮特許出願番号は別紙の追補優先権欄にて記載する。

☐ Additional provisional application numbers are listed on a supplemental priority sheet attached hereto.

私は、合衆国法典第35部第120条に基づく下記の合衆国特許出願、又は第365条(c)項に基づく合衆国を指名したPCT国際出願の利益を主張し、本願の請求の範囲各項に記載の主題が合衆国法典第35部第112条第1項規定の態様で、先の合衆国特許出願又はPCT国際出願に開示されていない限度において、先の出願の出願日と本願の国内出願日又はPCT国際出願日の間に有効となった連邦規則法典第37部第1章第56条に記載の特許要件に所要の情報を開示すべき義務を有することを認める。

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s), or §365(c) of any PCT international application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

(Application No.)
(出願番号)

(Day/Month/Year Filed)
(出願の年月日)

(現況)
(特許済み、係属中 放棄済み)

(Status)
(patented, pending, abandoned)

(Application No.)
(出願番号)

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(特許済み、係属中 放棄済み)

(Status)
(patented, pending, abandoned)

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Japanese Language Utility or Design Patent Application Declaration

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顧客番号 7055

現在選任された弁護士は下記の通りである。

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(Supply similar information and signature for third and subsequent joint inventors.)

Japanese Language Utility or Design Patent Application Declaration

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(Supply similar information and signature for subsequent joint
inventors.)